

### **REMARKS**

Applicant thanks the Examiner for the very thorough consideration given the present application. Claims 4, 12, and 17 have been withdrawn from the present application. As such, Claims 1-3, 5-11, 14-16 and 18-25 are pending in the present application. Claim 13 has been canceled. The Examiner is respectfully requested to reconsider and withdraw his rejections in view of the amendments and remarks as set forth below.

### **CLAIM OBJECTIONS**

Claims 12 and 19-25 are objected to for certain informalities. Claim 12 has been withdrawn. Claims 19-25 have been amended according to the Examiner's suggestion. Therefore, reconsideration and withdrawal of this objection are respectfully requested.

### **REJECTION UNDER 35 U.S.C. § 103**

Claims 1-3, 5-11, 14-16 and 18-25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over either Winfree et al. 6,439,503 or Bussing et al. in view of Shann. This rejection is respectfully traversed.

Claim 1 now recites "an optical ignition subsystem positioned independently of and apart from the detonation banks for generating a plurality of optical pulses, the optical pulses igniting each fuel/oxidizer mixture such that the chambers detonate in a desired order". Claim 10 now recites "where the detonation banks are positioned independently of and apart from the optical ignition subsystem". Claim 14 now recites

“where the optical pulses are generated by an optical ignition subsystem positioned independently of and apart from the chambers”.

In contrast, Winfree et al. generally discloses a pulse detonation cluster having a cluster housing and a plurality of pulse detonation engines mounted with the cluster housing. Of particular interest, Winfree et al. discloses at least two igniters 69 disposed in the upstream end wall of the detonation chamber 25 of the detonation engines 15. Furthermore, Winfree et al. discloses that it is preferred to have at least four igniters in the chamber, where each igniter is spaced 90 degrees apart (Col. 4, lines 12-21 and Figure 1). As such, it appears that the fuel mixture in each chamber is detonated by at least two igniters located within the chamber, whereas the present invention includes an independent ignition subsystem positioned apart from the banks that generates optical pulses that are multiplexed to ignite each fuel/oxidizer mixture in each of the plurality of chambers within each of the plurality of banks in a desired order. Winfree et al. fails to teach or suggest employing an independent optical ignition subsystem positioned apart from the banks for generating a plurality of optical pulses, the optical pulses igniting each fuel/oxidizer mixture such that the chambers detonate in a desired order. In addition, Winfree et al. does not teach or suggest an optical transport subsystem for transporting the optical pulses from the optical ignition system to the chambers.

Bussing et al. generally involves a pulse detonation rocket engine having at least two detonation chambers. Of particular interest, each of the detonation chambers 12 includes an igniter 46 that initiates detonation of a fuel and oxidant mixture in the chamber (Figure 5). Bussing et al. fails to teach or suggest employing an independent optical ignition subsystem positioned apart from the chambers for generating a plurality

of optical pulses, the optical pulses igniting each fuel/oxidizer mixture such that the chambers detonate in a desired order. Furthermore, Bussing et al. does not teach or suggest using an independent optical transport subsystem for transporting the optical pulses from the optical ignition subsystem to the chambers. The igniters of Bussing et al. are mounted onto the chambers. As such, Bussing et al. actually teaches away from using an independent optical ignition subsystem and an optical transport subsystem positioned apart from the chambers because the system in Bussing would have no need for, and would not benefit in any way, from the use of an independent optical ignition subsystem.

The Examiner relies on Shann '195 to remedy the shortcomings of both Winfree et al. and Bussing et al. Specifically, the Examiner submits that Shann teaches a laser ignition subsystem with a laser source, means for separating the laser energy into different paths and optical fibers forming the paths. However, Applicant submits that both Winfree et al. and Bussing et al. teach away from using the optical ignition subsystem of the present application. Winfree et al. and Bussing et al. disclose igniters within the chambers for detonating the chambers. As such, Winfree et al. and Bussing et al. appear to teach away from using the optical ignition subsystem of the present application. Therefore, it would not have been an obvious design choice to one having ordinary skill in the art at the time the invention was made to use an optical ignition subsystem with the system of Winfree et al. or Bussing et al. Such design choice would significantly alter the structural design of Winfree et al. and Bussing et al. in a manner that would not have been obvious to one of ordinary skill in the art.

Therefore, it is respectfully submitted that independent Claims 1, 10, and 14, along with claims depending either directly or indirectly therefrom, are now patentable and in condition for allowance.

**CONCLUSION**

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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